

Change and Choices: Introduction to “On the Social Role of Computer Communications”

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Invited Paper

I. INTRODUCTION

There is urgency to this short essay by Robert Fano—urgency surrounded by an extraordinarily prophetic understanding about what a “computer-communication” (CC) network could become. It is easy to be enamored with the prophecy; it is harder to understand the urgency. In a world of ubiquitous computing, linked seamlessly by a communications network that matches almost precisely the picture that Fano sketched, it is difficult to understand what all the fuss was about.

But we will miss something important if we ignore Fano’s worrying. For his concern remains. The great insight in Fano’s essay is not his foretelling of the future of the Internet. The great insight is his showing how there were different futures for a CC network, and that among these futures we have a choice.

The particular choice that Fano urged was between two architectures for the CC network—one that empowered individuals, that respected their “dignity,” that decentralized control, the other that centralized information and control, that removed individuals from decisions, and that disabled democratic responsibility. Both futures were possible, but it was the second, Fano feared, that was increasingly the more likely. To avoid it, we had to make “a conscious and determined choice” to “make computer based services available to the public.” Unless we made such a choice, “the growing gap of knowledge in society is likely to become so wide that it will be extremely difficult to return to anything resembling a democratic society.”

In this particular, Fano was mistaken. We did not need a “conscious and determined choice” to realize the network he wanted. The trend towards the architecture that Fano feared was reversed without any determined choice by any significant “we.” The Internet replaced it. Yet the Internet was not a resolve by Congress or won by an uprising of

disempowered individuals. It was a revolution, but a stealth revolution. It was a change born offstage, far from the responsible, self-conscious, deliberative process that Fano urged.

But it was an accident that Fano was wrong, and we cannot count on such accidents in the future. His essay helps us see where the invisible hand is not enough. This insight is as critical to the architecture of the network now as it was then.

The choices we face now will not seem as dramatic perhaps. Orwell’s *1984* is not in our future, even if Fano feared it in our past. Yet cyberspace is more a part of our future than even Fano imagined it in our past. Thus the life that gets constituted there by the large range of details that become built into the space is critical. Fano’s essay helps us see why.

II. INTERNET ARCHITECTURE AND CULTURE

A CC network is built, it is not found. It is built by “architects” and coders—by those who design the network and by those who code the design. These architects choose among designs. These choices are many and are fine grained and complex. Yet together they construct a type of world. As Fano puts it, they involve “a social decision.”

These architects and coders build these networks within particular institutions—within corporations, governments, universities, or organizations like the Internet Engineering Task Force (IETF). These institutions—their culture, and their objectives—affect the character of the code that gets written within them. Universities and the IETF inspire open code with common protocols; corporations (until the Linux movement) foster closed code with, when Fano wrote, proprietary protocols. The government has historically inspired both—it was the National Science Foundation (NSF) and the Defense Department that induced the Internet; it is the National Security Agency (NSA) that is fighting link-level encryption on the Internet.

How a network develops is in part a function of the institutions that architect it. Networks, in this sense, like

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humans and rats, respond to the incentives around them, as those architecting networks respond to the incentives around them. Code architected at Massachusetts Institute of Technology (MIT) will contribute billions to the economy though not billions to MIT; code architected in Redmond and in the Valley will contribute billions to the economy and billions to Redmond and the Valley. The difference is not the code; the difference is the culture of MIT versus the Valley.

Fano wrote at a time when the most significant code constituting the CC network was code architected within corporations—indeed, code architected within either state-sanctioned monopolies (the telephone company) or corporations with extraordinary market power (IBM). When Fano wrote, the “free software movement” was just being started by his colleague Richard Stallman. The concerns that animated Stallman were the concerns that influenced Fano: would a network architected by people who answered to Wall Street be a network that reflected the values of our society?

Fano feared that it would not. Code writers at the telephone company or at IBM were not going to write code that threatened their returns. They could not be expected to write code that would enable direct competitors. It may well be—and I certainly believe it—that the world would have been a wealthier place had they done so; it may even have been—and of this I am not sure—that it would have been better for these companies. Yet even if in the long run an open and nonproprietary network would have been better for these companies, executives do not live in “the long run.” To expect corporate sacrifice in the name of society is to demand of them more than we demand of anyone.

Thus the “trends,” Fano believed, were in the other direction towards a closed, proprietary network. In a wide range of areas—from data storage to information control—he outlined the choices that this CC architecture would present, and in some cases his fear about how those choices would come to be made.

This fear pushed him to write the Classic Paper that appears in this PROCEEDINGS. We, as a culture and as a democracy, had to act to change the “legal and institutional” structures that gave the architects of the CC network the incentives they had, before the incentives they had induced a network that would undermine the values of our tradition.

Fano’s focus on incentives is important, and his refusal to moralize the issue is crucial. The code of the CC network would develop as he predicted not because the coders were evil. There is nothing wrong with the world where individuals—both within corporations and without—act on the basis of incentives. There is certainly nothing criminal in a company acting, within the confines of the antitrust laws, to maximize its return. Fano was not attacking the system; he was simply arguing that the system did not properly incent the architects. There are values beyond those that would be realized by companies acting on their own. That is not to criticize corporations; it is simply to remark a point that has been long understood. What is good

for General Motors, or good for AOL, is not necessarily good for America.

III. INTERVENTION BY WHOM

Fano was never quite explicit, however, about who the “we” was who were going to carry out this other role. One might have thought it was government, but Fano shies from the “g” word. “We” had to make a choice; how was left unspecified.

This is my only real quibble with this extraordinary essay. Fano ignores the role of the government—not just the role the government might play, but also the role it did play. For example, in contrasting the architecture of wire telephony with the architecture of radio, Fano remarks that the telephone system was a “general purpose network.” This is not quite true of the telephone network in 1971, or not yet then completely true as I will explain below. Yet Fano gives the impression that the telephone company chose to make the network that way—that it was designed, that is, to permit openness or a general purpose use—and this is just wrong.

For much of the history of the telephone network, the telephone network was essentially closed. For much of its history, the telephone company controlled access to the network from end to end. You were not permitted to attach a non-Bell phone to the network; you were not permitted to attach a device that would hush the sounds from the room on the phone. You could only take the network as Bell gave it to you.

This changed because the government intervened to change it. Beginning with the Carterfone Decision in 1968, the government slowly began to insist that the telephone network open its lines to other people’s phones, and then other people’s modems, and then other people’s service. It was an active and powerful government that pried open the closed network of the telephone system.

If you need a place to begin the story of what made the Internet possible, it was this set of decisions by the Federal Communications Commission (FCC) and the courts. By removing control over the use and attachments that the telephone network would permit, and vesting that control in users, the government made it possible for people with different visions about how a communications network might be used to have a role in implementing these different visions.

The key here is critical. The telephone network was an extraordinarily profitable monopoly; no rational manager of that monopoly would risk that monopoly on another form of communication, at least when the only power that other form had was the power of an idea. The only way this monopoly could be challenged was by enabling an architecture where people with different visions of communication could actually carry that vision into effect; and the only way this ability could be guaranteed was by requiring that access to the telephone network be granted by AT&T on terms that were not discriminatory. This guarantee was given by the government, not by AT&T.

AT&T fought this change; it claimed that open access would defeat the network; and it twisted as hard as it could to resist the regulators' plan. Yet in the end, AT&T lost, the regulators won, and the Internet was born.

Here was a "we" who did do something good. At first the FCC, and then the Attorney General for Antitrust, William Baxter: both insisted on open access for this network so that people other than AT&T and IBM might participate in its design.

IV. THE NETWORK AS COMMONS

This decision by the government to insist that these networks be open seeded the Internet. By removing control over the development of the network from legacy monopolies, the government enabled an extraordinary collective of differently thinking people to have a shot. And not just enabled, for the government took a strong roll in forcing research institutions to support the emerging Internet. It conditioned funding at some university departments on their deploying Internet technologies. It was this funding the development of key technologies that let the Internet bloom.

Both moves made it possible for the design of the CC network to become the problem of millions rather than a profit opportunity for a few. By shrinking the footprint of monopoly control, the government expanded the space where other creative sorts might work. These other creative sorts had incentives, but these incentives were different. The researchers who laid the foundations for the Internet were more interested in open exchange than in the New York Stock Exchange. They had an ethic to enable others rather than a competition to engage. Like researchers in biology or in the natural sciences, these researchers took the Internet to be a common problem. Millions simultaneously could work on this common problem without the coordination of any single strategic actor.

That effort built the network that Fano's prescience had described. It was built because a diverse collection of individuals from a diverse collection of institutions could architect and code in a context where no single strategic vision had control.

V. NOT AS IT WILL BE

Fano wrote at a time where networks and computers were closed. It was hard to imagine things differently. We live at time where the network is open. It is hard for us to imagine things differently. Yet after achieving Fano's dream, we should not lose his insight, for there is no assurance that this network will remain as open as it is and plenty of reason to fear that it will not.

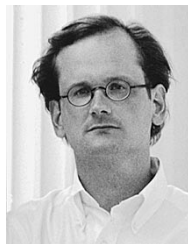
We need now, as Fano said then, a certain vigilance in the shepherding of our CC network. We must identify contexts where existing incentives are not sufficient to secure the values that are important to our tradition. (Privacy is an example here.) We must watch for shifts in the architecture of the Internet that might enable legacy monopolies to again gain control over the architectures of the CC network. [The emerging architecture for broad-band cable might be an example here, as it closes competition in the Internet service provider (ISP) market.] These risks remain, and indeed grow, as the Internet becomes the single most important locus for growth in commerce.

I am a lawyer and a professor of constitutional law. I am not a technologist. I am thus perhaps technologically the least qualified author that this PROCEEDINGS has seen. Yet I do recognize the problem that Fano has identified. It is, in an important sense, just the problem of constitutional law generally.

A constitution is to regulate the ordinary exercise of power. It is to assure that a society stays connected to the values it considers fundamental. It does this best when it architects power so that power gets checked, and where it reinforces values where existing institutions will not.

The choices that Fano urged did both. His concern was an architecture that disabled individual control and that sacrificed important values from our tradition. He urged us to see the choices there were and to choose differently. He urged a constitution that would code individual control and inhibit disabling trends towards centralization.

The same choices remain, and as commerce begins to occupy the Internet, they will become more pressing. The network as it is is not the network as it will be. It will evolve and change as architects bring to it code that enables certain ways of interacting and disables other. We have as much need now to understand the choices in this change as we did in 1972. Indeed, as the Internet becomes our life, we have more.



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